

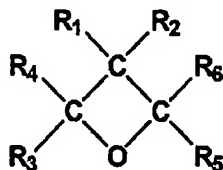
Appl. No. 10/647,170
Reply to Office Action of March 17, 2005

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An actinic ray curable composition containing a photo acid generator, and an oxetane compound I ~~represented by the following formula 1~~ of the following formula,

~~Formula 1~~



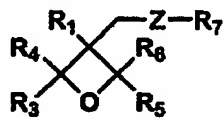
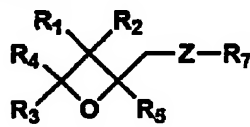
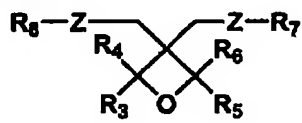
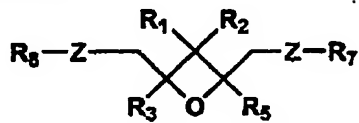
wherein R₁, R₂, R₃, R₄, R₅, and R₆ independently represent a hydrogen atom, a fluorine atom, an alkyl group having from 1 to 6 carbon atoms, a fluoroalkyl group having from 1 to 6 carbon atoms, an allyl group, an aryl group, a furyl group or a thienyl group, provided that R₃, R₄, R₅, and R₆ are not simultaneously hydrogen atoms, and wherein the longer C-O bond distance of the two C-O bond distances in the formula [[1]] is from 0.1464 to 0.1500 nm.

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Claim 2 (Canceled).

3. (Currently Amended) The actinic ray curable composition of claim 1, wherein the composition further contains an oxetane compound II ~~having one oxetane ring which falls outside formula 1~~ represented by formula 2, 3, 4 or 5 or an oxetane compound III ~~having two or more oxetane rings represented by formula 6 or 7.~~

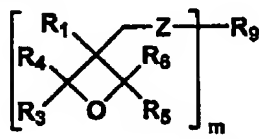
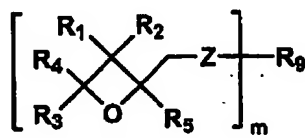
Formula 2Formula 3Formula 4Formula 5

wherein R₁, R₂, R₃, R₄, R₅ and R₆ independently represent a hydrogen atom or a substituent; and Z represents an oxygen atom, a sulfur atom, a divalent hydrocarbon group or a

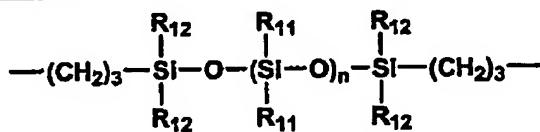
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divalent hydrocarbon group in which an oxygen atom or a sulfur atom is intervened,

Formula 6Formula 7

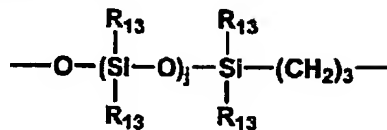
wherein R_1 through R_6 independently represent a hydrogen atom, a fluorine atom, an alkyl group having a carbon atom number of from 1 to 6 such as a methyl group, an ethyl group, a propyl group or a butyl group, a fluoroalkyl group having a carbon atom number of from 1 to 6, an allyl group, an aryl group, or a furyl group; m is 2, 3, or 4; Z represents an oxygen atom, a sulfur atom, a divalent hydrocarbon group or a divalent hydrocarbon group in which an oxygen atom or a sulfur atom is intervened; and R_9 represents a straight chain or branched chain alkylene group having from 1 to 12 carbon atoms, a straight chain or branched chain poly(alkylene oxy) group, or a divalent group selected from the group consisting of the following formula 9, 10 and 11,

Formula 9

wherein " n " represents an integer of from 0 to 2000; R_{11} represents an alkyl group having from 1 to 10 carbon atoms or a group represented by the following formula 12; and R_{12} represents an alkyl group having from 1 to 10 carbon atoms,

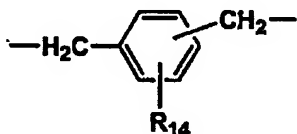
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Formula 12



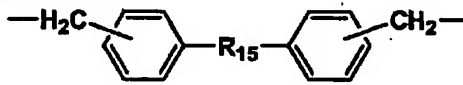
wherein j represents an integer of from 0 to 100; R₁₃ represents an alkyl group having from 1 to 10 carbon atoms,

Formula 10



wherein R₁₄ represents an alkyl group having from 1 to 10 carbon atoms, an alkoxy group having from 1 to 10 carbon atoms, a halogen atom, a nitro group, a cyano group, a mercapto group, an alkoxycarbonyl group or a carboxyl group,

Formula 11



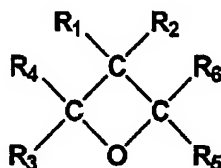
wherein R₁₅ represents an oxygen atom, a sulfur atom, -NH-, -SO-, -SO₂-, -(CH₂)-, -C(CH₃)₂- or -(CF₃)₂-.

4. (Original) The actinic ray curable composition of claim 1, wherein the composition further contains an oxirane compound having an oxirane ring.

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5. (Original) The actinic ray curable composition of claim 1, wherein the composition has a viscosity at 25 °C of from 7 to 50 mPa.s.

6. (Currently Amended) An actinic ray curable composition containing a photo acid generator, and an oxetane compound I' ~~represented by the following formula 1~~ of the following formula,
 Formula 1



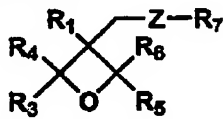
wherein R_1 , R_2 , R_3 , R_4 , R_5 , and R_6 independently represent a hydrogen atom, a fluorine atom, an alkyl group having from 1 to 6 carbon atoms, a fluoroalkyl group having from 1 to 6 carbon atoms, an allyl group, an aryl group, a furyl group or a thienyl group, provided that R_3 , R_4 , R_5 , and R_6 are not simultaneously hydrogen atoms, and wherein in the formula $[[1]]$, the longer C-O bond distance of the two C-O bond distances is from 0.1435 to 0.1461 nm, and the oxygen atom has a charge of from -0.330 to -0.281.

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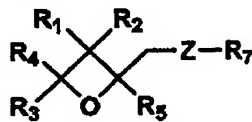
Claim 7 (Canceled).

8. (Currently Amended) The actinic ray curable composition of claim 6, wherein the composition further contains an oxetane compound II ~~having one oxetane ring which falls outside formula 1~~ represented by formula 2, 3, 4 or 5 or an oxetane compound III ~~having two or more oxetane rings~~ represented by formula 6 or 7,

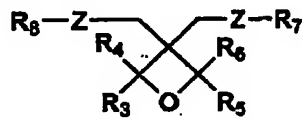
Formula 2



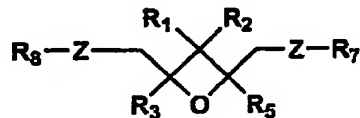
Formula 3



Formula 4



Formula 5



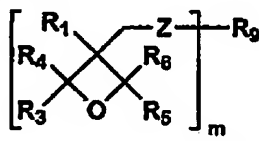
wherein R₁, R₂, R₃, R₄, R₅ and R₆ independently represent a hydrogen atom or a substituent; and Z represents an oxygen

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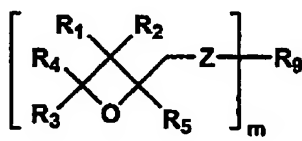
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atom, a sulfur atom, a divalent hydrocarbon group or a divalent hydrocarbon group in which an oxygen atom or a sulfur atom is intervened,

Formula 6

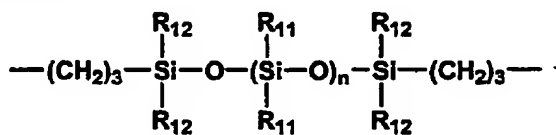


Formula 7



wherein R_1 through R_6 independently represent a hydrogen atom, a fluorine atom, an alkyl group having a carbon atom number of from 1 to 6 such as a methyl group, an ethyl group, a propyl group or a butyl group, a fluoroalkyl group having a carbon atom number of from 1 to 6, an allyl group, an aryl group, or a furyl group; m is 2, 3, or 4; Z represents an oxygen atom, a sulfur atom, a divalent hydrocarbon group or a divalent hydrocarbon group in which an oxygen atom or a sulfur atom is intervened; and R_9 represents a straight chain or branched chain alkylene group having from 1 to 12 carbon atoms, a straight chain or branched chain poly(alkylene oxy) group, or a divalent group selected from the group consisting of the following formula 9, 10 and 11,

Formula 9

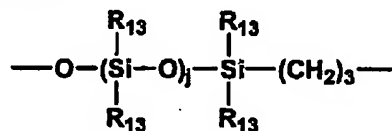


wherein n represents an integer of from 0 to 2000; R_{11} represents an alkyl group having from 1 to 10 carbon atoms

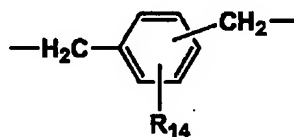
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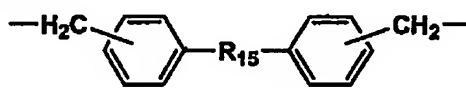
or a group represented by the following formula 12; and R_{12} represents an alkyl group having from 1 to 10 carbon atoms,
Formula 12



wherein j represents an integer of from 0 to 100; R_{13} represents an alkyl group having from 1 to 10 carbon atoms,
Formula 10



wherein R_{14} represents an alkyl group having from 1 to 10 carbon atoms, an alkoxy group having from 1 to 10 carbon atoms, a halogen atom, a nitro group, a cyano group, a mercapto group, an alkoxycarbonyl group or a carboxyl group,
Formula 11



wherein R_{15} represents an oxygen atom, a sulfur atom, -NH-,
 -SO-, -SO₂-, -(CH₂)-, -C(CH₃)₂- or -(CF₃)₂-.

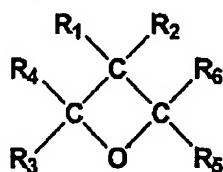
9. (Original) The actinic ray curable composition of claim 6, wherein the composition further contains an oxirane compound having an oxirane ring.

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10. (Original) The actinic ray curable composition of claim 6, wherein the composition has a viscosity at 25°C of from 7 to 50 mPa·s.

11. (Currently Amended) An actinic ray curable ink, containing pigment, a photo acid generator, and an oxetane compound I ~~represented by the following formula 1~~ of the following formula,

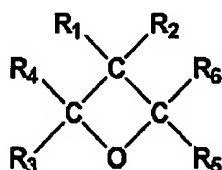
~~Formula 1~~

wherein R₁, R₂, R₃, R₄, R₅, and R₆ independently represent a hydrogen atom, a fluorine atom, an alkyl group having from 1 to 6 carbon atoms, a fluoroalkyl group having from 1 to 6 carbon atoms, an allyl group, an aryl group, a furyl group or a thienyl group, provided that R₃, R₄, R₅, and R₆ are not simultaneously hydrogen atoms, and wherein the longer C-O bond distance of the two C-O bond distances in the formula **[[1]]** is from 0.1464 to 0.1500 nm.

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12. (Currently Amended) An actinic ray curable ink, containing pigment, a photo acid generator, and an oxetane compound I' ~~represented by the following formula 1~~ of the following formula,

~~Formula 1~~



wherein R₁, R₂, R₃, R₄, R₅, and R₆ independently represent a hydrogen atom, a fluorine atom, an alkyl group having from 1 to 6 carbon atoms, a fluoroalkyl group having from 1 to 6 carbon atoms, an allyl group, an aryl group, a furyl group or a thienyl group, provided that R₃, R₄, R₅, and R₆ are not simultaneously hydrogen atoms, and wherein in the formula [[1]], the longer C-O bond distance of the two C-O bond distances is from 0.1435 to 0.1461 nm, and the oxygen atom has a charge of from -0.330 to -0.281.

13. (Currently Amended) An image forming method comprising the steps of:

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ejecting droplets of the actinic ray curable ink of claim 11 through a nozzle of an ink-jet recording head onto a recording material to deposit the ink on the recording material; and

irradiating the ink on the recording material employing an actinic ray, 0.001 to 2.0 seconds after the ejected ink has been deposited on the recording material, whereby the cured ink layer is formed.

14. (Original) The image forming method of claim 13, wherein the thickness of the cured ink layer is from 2 to 20 μm .

15. (Original) The image forming method of claim 13, wherein the volume of the ink droplets to be ejected is from 2 to 15 pl.

16. (Original) The image forming method of claim 13, wherein the ejecting of the actinic ray curable ink is carried out at 35 to 100°C.

17. (Original) An image forming method comprising the steps of:

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ejecting droplets of the actinic ray curable ink of claim 12 through a nozzle of an ink-jet recording head onto a recording material to deposit the ink on the recording material; and

irradiating the ink on the recording material employing an actinic ray, 0.001 to 2.0 seconds after the ejected ink has been deposited on the recording material, whereby the cured ink layer is formed.

18. (Original) The image forming method of claim 17, wherein the thickness of the cured ink layer is from 2 to 20 μm .

19. (Original) The image forming method of claim 17, wherein the volume of the ink droplets to be ejected is from 2 to 15 pl.

20. (Original) The image forming method of claim 17, wherein the ejecting of the actinic ray curable ink is carried out at 35 to 100°C.